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IN THIS ISSUE



## China and the UK join hands to implement the project "Extraction and use of coalbed methane from abandoned coal mine"

Sponsored by the Department of Trade and Industry of the United Kingdom, the project "extraction and use of coalbed methane from abandoned coal mine" is jointly implemented by the British Nortingham University, Wardell Armstrong China Limited and China Coal Information Institute (CCII), China Coal Research Institute (CCRI) Xi'an Branch and China University of Mining and Technology. This project is implemented during January 2001 ~ August 2002. The purpose of this project is to study and analyze the future prospects of extraction and utilization of mine gas from abandoned coal mines and at the same time push forward the extraction and utilization of mine gas extracted from abandoned coal mines in China through Sino-UK cooperation.

China is a country with abundant coal resources, with very long history of coal mining. Along with the depletion of coal reserves in coal mines, however, a large number of coal mines have been closed and still a large number of coal mines are to be closed. Statistics show that by the year 1999, a total of 459 state-owned key coal mines were abandoned and a national total of over 30.0 billion tons of remained coal was abandoned in these mines and gobs of active mines. It is estimated that the proven gas reserves in these coal mines is as much as over hundreds of billion $m^3$. In fact, out of the nearly 600 mines owned by the state-owned key coal companies, 1/3 are in the category of coal mines with depleted coal reserves. In China, the majority of abandoned coal mines are located in highly gaseous coal mining areas. Not only are these areas rich in coal resources, the majority of coal mines have been equipped with underground mine gas extraction systems and gas supply and distribution system on the surface. In

this way, a stable gas supply is guaranteed and investment in infrastructure is minimized. In the light of these circumstances, abandoned coal mine gas extraction and utilization is of very promising prospects in China.

The United Kingdom leads the world in abandoned coal mine gas extraction and use in power generation. So far, a total of 5 abandoned coal mine gas power generation projects are in place in the UK and all are in normal operation. Abandoned coal mine gas extraction for power generation in the UK has a very promising future. Abandoned coal mine gas power generation in the UK mainly uses three types of power generating units, i.e. gas turbines manufactured by companies like Deutz, Jenbacher and MAN. Practice indicates that mine gas power generation is not only economically feasible, but also produces remarkable environmental benefit.

As a key member of the project implementing group, China Coal Information Institute (CCII) has so far completed the preliminary calculation of proven gas reserves in abandoned coal mines and gobs in active coal mines in China. This is accompanied by the identification of 10 major coal mining areas such as Tongchuan, Fushun, Fengcheng, Yongrong, Tianfu, Nantong, Yangquan, Shuicheng, Hegang and Jixi etc.

## Sino-Canada cooperative project "CBM technology development/$CO_2$ sequestration in China" officially started

The Ministry of Foreign Trade and Economic Cooperation (MOFTEC) of the People's Republic of China and the International Development Agency of Canada signed a memorandum of understanding on "CBM technology development/$CO_2$ sequestration in China" on March 15, 2002 in Beijing. The signing of this document indicates the official start of this project which is one of the sub-projects under the Canadian climate change development foundation program. The purpose of the establishment of the program is to support the activities of developing countries in seeking alternative solutions to root problems in climate change. At the same time, this Sino-Canadian project is also designed to push forward sustainable development and elimination of poverty in developing countries. Total investment of this project amounts to 51.0 million yuan, of which the Canadian side puts in 5.0 million Canadian dollars and the Chinese side puts in 25.0 million yuan.

Canada leads the world in $CO_2$ enhanced CBM recovery by $CO_2$ injection. This technology is of great potential in developing the coalbed methane resources that can't be recovered by conventional technologies. In coal seams, $CO_2$ has stronger adsorption compared with methane. The practice of injecting $CO_2$ rejected by the near-by energy producing bases and other industrial enterprises into unminable coal seams in deep part of the strata helps release the methane therefrom. The $CO_2$ injected, however, will stay there in the deep seam permanently. Methane is both a clean energy and a greenhouse gas. Its greenhouse effect is 21 times as strong as that of $CO_2$. The application of this technology will not only improve the recovery rate of coalbed methane, but also greatly reduce the greenhouse gas emission.

The purpose of this project is to: (1) transfer effective CBM extraction technology to China. By using this technology, greenhouse gas $CO_2$ is to be injected into the deep unminable coal seams and stored there and (2) establish stable

and sustained economic relations between CBM related businesses of China and Canada. Major tasks of this project are to use Canadian technology for repeated small-scaled and large-scaled pilot tests in different areas in China in a hope to form a commercialized CBM production and $CO_2$ injection in China; improve the capabilities of the Chinese engineers, technicians, management personnel and government officials in mastering the Canadian CBM technologies; promote the popularization and application of Canadian CBM technology and Canadian environmental protection and safety technology that are adapted to the Chinese conditions on the basis of the economic ties established by this project.

The Canadian implementing agencies are mainly composed of Alberta Research Institute, Canadian Computer Simulation Group and Canadian Sproule International Co Ltd, who are in charge of direct Canadian financial inputs into this project, providing technical assistance and training to Chinese partners, pushing the project to produce expected results and reach development goals. The Chinese implementing agencies are composed of China United Coalbed Methane Co Ltd, who is to provide in kind support including geological materials and data, hydrological materials and data and geophysical data as well as relevant licenses, small-sized pilot test drilling, well completing apparatus and related services required by the project, etc.

## " West-east gas pipeline" project favorable to commercialization of CBM development and utilization in China

The feasibility study report of the project "West-east gas pipelines" that attracts the world's attention was ratified by the State Council of China at the beginning of February, 2002, which indicates the official start of this project. Starting from Tarim Basin in Xinjiang Uygur Autonomous Region, the project will traverse a total of 7 provinces, municipalities and autonomous regions before it finally sends natural gas to Shanghai. The 3,900km long natural gas pipeline will pass over major energy productive bases in the central part of China. Once completed in 2005, the project is to supply natural gas to the eastern regions of China at an annual capacity of 12.0 billion $m^3$. the implementation of this project will, to a large extent, solve the "bottle-neck" problem – the construction of pipelines – that presents an obstacle to the development of coalbed methane in China, hence greatly speeding up the commercialization process of CBM development and utilization in this country.

Based on the design requirements, the project requires to be backed by a 1,000 billion $m^3$ of natural gas geological reserves. In fact, the presently proved geological reserves of natural gas in Tarim Basin is only recorded at about 700 billion $m^3$, naturally additional gas sources or alternative gas sources are required. As a non-conventional clean energy with over 95% of $CH_4$, coalbed methane's calorific value is as high as 8000 ~ 9000kcal/$m^3$. Thus coalbed methane is qualified to infect into the natural gas pipeline system.

The pipeline of the project passes mainly coalbed methane rich areas of this country. These areas are also known for densely distributed large- and medium-sized coalbed methane reservoirs. From the west to the east on the passage of the project pipeline, the pipeline pushes its way through 11 coalbed methane accumulating areas including Tarim North, Chaidamu North-Qilian, Erdos-West,

Wei-Bei, Erdos-East, Huozhou West, Qinshui, Taihang Mountain East, Henan-West, Xuzhou-Huaihe and Huainan CBM reservoirs, with a total CBM resources of nearly 10 trillion $m^3$. This is more than the total natural gas reserves of 8.39 trillion $m^3$ in Tarim Basin. The pipeline passes through some large-sized coalbed methane fields where intensive CBM exploration and development experiments took place during the last decade and substantial achievements have been obtained therefrom. High CBM production wells are tried in Jincheng, Lu'an and Shouyang target areas in Qinshui coal field in Shanxi Province, Liulin, Sanjiao, Shilou and Sanjiaobei blocks in the east rim of Erdos Basin, Hancheng target area in Weibei area, Sunan syncline area in Huaibei as well as in Xinji blocks in Huainan coal mine area. Some of these target areas and/or blocks have displayed very promising potential for large-scaled commercial development prospects.

Downstream project development has long been an obstructing factor that prevents the development of CBM for a long time. The implementation of the project "West-East Gas Pipeline", however, not only provides a ready pipeline condition to the CBM exploration and development, it but also helps solve the problem of coalbed methane sales and utilization. This almost eliminates the major bottleneck obstructing the large-scaled CBM by surface well, which in turn strengthens the confidence of potential foreign investors, hence quickening the pace of the formation of coalbed methane industry in China. In addition, an intensified exploration and development of coalbed methane along the pipeline will also provide sufficient alternative gas supply to the project.


## China Climate Conference held in Beijing

Sponsored by the National Meteorological Bureau, the 1st China Climate Conference was held in Beijing on April 5 ~ 6, 2002. More than 200 experts and researchers from meteorological

services, marine research, agricultural research,forest industry, science and technology circleand energy sector participated in this event. LiPeng, chairman of the Standing Committee of the National People's Congress, sent a letter of congratulations to this conference. Hu Qili, vice chairman of the National People's Political Consultative Conference, presented at the conference and made a keynote speech.

Main topics of this conference is to discuss the "China National Climate Plan Program (2001~2010)", China Climate System Observation Plan" and review the "Suggestions on Intensifying Our Work on Climate". As important parts of this conference, identification of the work direction for the next ten years, promoting the inter-discipline exchanges and contacts between relevant branches of sciences related with climate change as well as coordinating the climate work of different departments and organizations are also conducted on the basis of summarizing the experiences of the work on climate in this country.

In the next ten years, China is to put in 8.0 billion yuan on the research in climate change in China. Parallel to these activities is the construction of relevant infrastructures including global warming monitoring facilities. These funds will be solved by governmental budget, issuance of treasury bonds and special state foundations. This reflects the government enthusiasm in preventing further climate worsening in this country.

China is the second largest CO2 emission country in the world. CO2 emission of China accounts 12% of the world total, just next to the United States at 22%. The latest research indicates that the global average temperature has risen by 0.6 ℃ over the last century. It is predicted that in the next 100 years, the world average temperature will rise by a further 1.6 ℃. Undoubtedly, this will result in more and more unfavorable climate changes such as droughts, floods and heat waves, etc.

## "China-UK workshop on clean coal technology projects" held in Beijing

Under the sponsorship of the Department of Trade and Industry (DTI) of the United Kingdom, China International Centre for Technical and Economic Exchanges and the State Administration of Coal Mine Safety Supervision, China-UK Workshop on Clean Coal Technology organized by China Coal Information Institute (CCII) was successfully held in Kunlun Hotel, Beijing on March 11, 2002. Presented at the Workshop were more than 100 clean coal technology experts from China's coal sector, power sector, boiler manufacturing industry and environmental protection authorities as well as experts and participants from the DTI of the UK and some British companies.

Summarizing the achievements and experiences obtained from the China-UK clean coal technology projects, the workshop covered wide areas of clean coal technology including coal preparation, coalbed methane drainage from coal mines and utilization, underground coal gasification, advanced power generation, integrated gasification combined cycle (IGCC) for power generation, boiler combustion technology and pollution control technology, etc. Participants to the workshop also discussed the development status, technological demands and future development plan for clean coal technology in China.

On the basis of these topics, participants also discussed their plans for their work in the next stage and the future prospects of the CCT. They also expressed their conducive comments on the further cooperation between China and the UK in the development of clean coal technology.

The workshop provided a precious opportunity for investors and technology developers from other countries to conduct direct dialogues with the Chinese companies. The workshop thus provided a vigorous thrust to the cooperation between China and the United Kingdom in the field of clean coal technology.

## Building capacity for the clean development mechanism in China

The "Climate Change Convention" signed at the United Nations Environment and Development Conference held in Brazil in 1992 declares that all signatory countries are committed to reduce greenhouse gas emission. It is on the basis of the Joint Implementation and Clean Development Mechanism (CDM) that the Emission Trade Market is established. Greenhouse gas emission mitigation projects thus became the hot areas supported and invested by developed countries and relevant international institutions. China also signed on the Kyoto Protocol for the encouragement of CDM capability enhancement and international cooperation on greenhouse gas emission mitigation.

China Coal Information Institute (CCII) and Tsinghua University jointly completed the USDOE assisted project "Evaluation of GHG Emission Mitigation Technology and Related Strategic Studies" in 1996. By the end of 2001, the Energy Research Institute (ERI) of the State Devebpment and Planning Commission (SDPC) led a research group in applying for the UNDP project "Building capacity for the clean development mechanism in China" with a total project funds up to 1.8 million yuan. China Coal Information Institute (CCII) is a member of the project implementing group. By now, governmental organizations of 8 countries have indicated that they would provide supports to this project. These countries are the United States, Canada, the United Kingdom, Holland, Sweden, Norway and Japan, etc. The purpose of this project is to: (1) improve China's capabilities in CDM for future implementation; (2) assist China to apply for international support to the CDM projects. Just recently, the project group identified three key areas, i.e. (1) energy efficiency; (2) renewable energy; (3) coalbed methane. Huang Shengchu, Vice President of China Coal Information Institute (CCII), is engaged in the UNDP's project as key specialist and responsible for the study in the area of "coalbed methane", one of the keyareas covered by this project.

## CBM development in Tiefa coal mining area: the latest progress

Tiefa Coal (Group) Co Ltd is the largest coal producer in northeast China. Its annual raw coal output is around 14.0Mt. With a total coalfield area of 513km2, Tiefa coalfield has a total CBM reserves of 18.72 billion m3. There are currently7 active coal mines that are all highly gaseous mines. 11 sets of underground gas drainage systems are in operation with a total drainage capacity of 924m3/min. The annual total gas drained in 2001 is recorded at 62.06 million $m^3$ .

of pure methane.

With good coalbed methane reservoirs conditions, Tiefa coal mining area is identified as both a UNDP demonstration project and a Japanese Green Assistance demonstration project. So far, a total of 11 surface wells have been drilled in Tiefa coal mining area including 6 gob surface wells and 5 surface vertical wells. The single gob well gas production is averaged at over 10,000$m^3$/d and the highest single vertical well daily production is as high as 7,000$m^3$/d.

Tiefa coal mining area has complete coalbed methane utilization facilities. Of the total of 11 surface drainage wells, 8 wells are connected to gas pipeline system which is of 80km in total length. The system is completed with 7 gas tanks with total capacity of 107,500$m^3$. 4 residential areas in Tiefa coal mining area have been furnished with coalbed methane utilization system serving a total of 38,000 households. Tiefa-Tieling gas pipeline was put into operation by the end of 2000. This is in fact the first ever coalbed methane transmission pipeline over long distance in China. This pipeline is 28km long with an annual gas transmission capacity of 20.0 million $m^3$. The current annual coalbed methane utilization capacity of Tiefa area is 22.0 million $m^3$ and the remaining 40.0 million $m^3$ is entirely vented to the atmosphere. In the light of this situation, Tiefa decided to supply gas to Shenyang city on the basis of consultation with Shenyang Municipal Gas Co. As the largest city in north east China, Shenyang city has a population of 7.0 million residents and 950,000 households in Shenyang are using pipelined fuel gas.

Tiefa coalbed methane project is now supplying an annual total of 60.0 ~ 80.0 million $m^3$ of fuel gas to Shenyang. Total investments incurred is 386.0 million yuan. Major engineering included in this gas supply project include coalbed methane development and coalbed methane transmission. In coalbed methane development, it is planned that 50 surface vertical wells and 27 surface gob wells are to be drilled. In coalbed methane transmission, it is planned that a 44.5km long gas transmission pipeline is to be laid, with a 30,000$m^3$ capacity gas tank and a central gas distribution station with an annual distribution capacity of 78.50 million $m^3$/a.

Preliminary economic analysis indicates that the investment profit rate is 14.5% and its investment payback period is 8.4 years. Once it reaches full capacity operation, it will yield annual gas sales revenue of 130.0 million yuan at the gas sales price of 1.45 yuan/$m^3$. By now, the pre-feasibility study report of this project has been ratified by Liaoning Provincial Development and Planning Commission and now it has been reported to the State Development and Planning Commission for its approval. Tiefa Coal Group welcomes both domestic and international companies and financial institutions to participate in the project development via joint venture operation or through any other cooperation modes.

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